Docket No.:

005920 USA/PMG/PCTRL

PATENT/OFFICIAL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

e Application of

SHANMUGASUNDRAM et al.

Serial No. 09/943,383

Group Art Unit: 2823

Filed: August 31, 2001

Examiner: William D. Coleman

For:

IN SITU SENSOR BASED CONTROL OF SEMICONDUCTOR PROCESSING

PROCEDURE

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Honorable Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached form PTO-1449. It is respectfully requested that the documents be expressly considered during the prosecution of this application, and that the documents be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This submission does not constitute a representation that a search has been made or that no better art exists and does not constitute an admission or representation that any of the listed documents is material or constitutes prior art. If it should be determined that any of the listed documents does not constitute prior art under the United States law, Applicants reserve the right 09943383

08/12/2004 EFLORES 00000030 080219

01 FC:1806 180.00 DA Serial No. 09/943,383

to present to the Office the relevant facts and law regarding the appropriate status of such

document.

The references listed on Sheet 1 of the attached PTO-1449 Forms were cited in a

patentability investigation and/or a corresponding foreign or PCT application relating to the

above-referenced application. The remaining references are from potentially related patent

applications, and possibly other sources.

Please charge the fee of \$180.00 under 37 CFR 1.17(p) to Deposit Account No. 08-0219.

The Commissioner is hereby authorized to charge any additional fees that may be required for

this submission, or credit any overpayment to deposit account no. 08-0219.

Respectfully submitted,

Wilmer Cutler Pickering Hale and Dorr LLP

Scott M. Alter

Registration No. 32,879

The Willard Office Building 1455 Pennsylvania Avenue, NW

Washington, DC 20004

TEL (202) 942-8428 SMA/lrm

FAX (202),942-8484

Date: \(\frac{1}{\pi}\)/04

SHEET 1 OF 5

AUG 1 1 200	CITATION CITATION APPLICA (PTO-1	N IN AN ATION	SURE	ATTY. DOCKET 005920 USA/ PMG/PCTRL APPLICANT SHANMUGAS FILING DATE August 31, 2001	UNDRAM e	SERIAL NO. 09/943,383 t al. GROUP 2823		
		FOR	REIGN PATEN	T DOCUMENTS	a to		*	
EXAMINER'S INITIALS	PATENT NO.	DATE	C	COUNTRY CLA		SUBCLASS	Translation Yes No	
	EP 1 066 925 A2	01/10/01	EP				X	
			<u> </u>					
						<u> </u>		
:								
				-	 			
				itle, Date, Pertiner	nt Pages, Etc	2.)		
	April 28, 2004. W	ritten Opinion	for PCT/US02/	19117.			 -	
							-	
								
				· · · · · · · · · · · · · · · · · · ·				
								<u>-</u>
								
EXAMINER			Γ	PATE CONSIDERE	ED			

INFORMATION DISCLOSURE
CITATION IN AN
APPLICATION
(PTO-1449)

ATTY. DOCKET NO. 005920 USA/ PMG/PCTRL SERIAL NO. 09/943,383

APPLICANT

SHANMUGASUNDRAM et al.

FILING DATE August 31, 2001 GROUP 2823

U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	4,957,605	09/18/90	Hurwitt et al.		<u> </u>	04/17/89
	5,240,552	08/31/93	Yu et al.	Yu et al.		12/11/91
	5,369,544	11/29/94	Mastrangelo	<u> </u>		04/05/93
_	5,444,837	08/22/95	Bomans et al.			12/29/93
	5,665,214	09/09/97	Iturralde			05/03/95
	5,695,810	12/09/97	Dubin et al.			11/20/96
	5,824,599	10/20/98	Schacham-Diamand et al.			01/16/96
	5,825,356	10/20/98	Habib et al.			03/18/96
	5,831,851	11/03/98	Eastburn et al.			03/21/95
	5,838,951	11/17/98	Song			08/28/96
	5,859,777	01/12/99	Yokoyama et al.			05/13/97
	5,871,805	02/16/99	Lemelson			04/08/96
	5,943,550	08/24/99	Fulford, Jr. et al.			03/29/96
	6,012,048	01/04/00	Gustin et al.			05/30/97
	6,037,664	03/14/00	Zhao et al.			03/31/98
	6,059,636	05/09/00	Inaba et al.			07/09/98
	6,096,649	08/01/00	Jang			10/25/99
-	6,100,195	08/08/00	Chan et al.			12/28/98
	6,114,238	09/05/00	Liao			05/20/98
	6,150,270	11/21/00	Matsuda et al.			01/07/99
	6,157,864	12/05/00	Schwenke et al.			05/08/98
	6,181,013 B1	01/30/01	Liu et al.		-	03/13/00
	6,212,961 B1	04/10/01	Dvir			02/11/99
	6,226,563 B1	05/01/01	Lim			09/04/98
	6,228,280 B1	05/08/01	Li et al.			05/06/98
	6,237,050 B1	05/22/01	Kim et al.			09/04/98
	2001/0006873 A1	07/05/01	Moore			02/13/01
	6,259,160 B1	07/10/01	Lopatin et al.			04/21/99
	6,281,127 B1	08/28/01	Shue			04/15/99

INFORMATION DISCLOSURE
CITATION IN AN
APPLICATION
(PTO-1449)

ATTY. DOCKET NO. 005920 USA/ PMG/PCTRL SERIAL NO. 09/943,383

APPLICANT

SHANMUGASUNDRAM et al.

FILING DATE August 31, 2001 GROUP 2823

U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	6,317,643 B1	11/13/01	Dmochowski			03/31/99
1	6,339,727 B1	01/15/02	Ladd			12/21/98
	6,355,559 B1	03/12/02	Havemann et al.			11/03/00
	6,391,780 B1	05/21/02	Shih et al.			08/23/99
	6,417,014 B1	07/09/02	Lam et al.			10/19/99
	6,427,093 B1	07/30/02	Toprac			10/07/99
	6,432,728 B1	08/13/02	Tai et al.			10/16/00
	6,449,524 B1	09/10/02	Miller et al.			01/04/00
	6,455,415 B1	09/24/02	Lopatin et al.		!	04/16/01
	2002/0165636 A1	11/07/02	Hasan			04/24/02
	6,484,064 B1	11/19/02	Campbell			10/05/99
	6,495,452 B1	12/17/02	Shih			08/18/99
	2002/0193899 A1	12/19/02	Shanmugasundram et al.			05/01/02
	2003/0017256 A1	01/23/03	Shimane		***	06/12/02
	6,515,368 B1	02/04/03	Lopatin et al.			12/07/01
	6,517,414 B1	02/11/03	Tobin et al.			03/10/00
	6,528,409 B1	03/04/03	Lopatin et al.			04/29/02
	6,537,912 B1	03/25/03	Agarwal			08/25/00
	6,580,958 B1	06/17/03	Takano			11/22/99
	6,605,549 B2	08/12/03	Leu et al.			09/29/01
	6,607,976 B2	08/19/03	Chen et al.			09/25/01
	6,609,946 B1	08/26/03	Tran			07/14/00
	6,616,513 B1	09/09/03	Osterheld			04/05/01
	6,624,075 B1	09/23/03	Lopatin et al.			11/05/02
	6,630,741 B1	10/07/03	Lopatin et al.			12/07/01
	6,660,633 B1	12/09/03	Lopatin et al.			02/26/02
	6,708,074 B1	03/16/04	Chi et al.			08/11/00
	6,708,075 B2	03/16/04	Sonderman et al.			11/16/01
	6,728,587 B2	04/27/04	Goldman et al.			12/27/00

INFORMATION DISCLOSURE CITATION IN AN APPLICATION (PTO-1449)				ATTY. DOCKET NO. 005920 USA/ PMG/PCTRL		SERIAL NO. 09/943,383		
AUG 1 1 2004	[]	(112)		APPLICANT SHANMUGASU	NDRAM e	t al.		
AUG 1 1 2004 E			FILING DATE GROUP August 31, 2001 2823					
		FOR	EIGN PATEN	T DOCUMENTS				
EXAMINER'S INITIALS	PATENT NO.	DATE	C	OUNTRY	CLASS			slation No
	EP 0 932 195 A1	07/28/99	EP		1		X	
	EP 1 083 470 A2	03/14/01	EP				X	
	GB 2 365 215 A	02/13/02	GB		 		X	
	OTHE	R ART (Inclu	ding Author, T	itle, Date, Pertinent	Pages, Et	c.)	<u> </u>	
	Sun, S.C. 1998. "C IEEE. pp. 243-246		Transition Met	al Nitrides as Diffusi	on Barriers	for Cu Metalli	zation.'	,
				shi. 1999. "Layered				
	Power Swing Sputtering (PSS) Technique for MOCVD-Cu Damascene Interconnects." <i>IEEE.</i> pp. 635-638. Yamagishi, H., Z. Tokei, G.P. Beyer, R. Donaton, H. Bender, T. Nogami, and K. Maex. 2000. "TEM/SEM Investigation and Electrical Evaluation of a Bottomless I-PVD TA(N) Barrier in Dual Damascene" (Abstract). <i>Advanced Metallization Conference</i> 2000. San Diego, CA.							
	Eisenbraun, Eric, Oscar van der Straten, Yu Zhu, Katharine Dovidenko, and Alain Kaloyeros. 2001. "Atomic Layer Deposition (ALD) of Tantalum-Based Materials for Zero Thickness Copper Barrier Applications" (Abstract). IEEE. pp. 207-209. Smith, S.R., K.E. Elers, T. Jacobs, V. Blaschke, and K. Pfeifer. 2001. "Physical and Electrical Characterization of ALD Tin Used as a Copper Diffusion Barrier in 0.25 mum, Dual Damascene Backend Structures" (Abstract). Advanced Metallization Conference 2001. Montreal, Quebec. Kim, Y.T. and H. Sim. 2002. "Characteristics of Pulse Plasma Enhanced Atomic Layer Deposition of Tungsten Nitride Diffusion Barrier for Copper Interconnect" (Abstract). IEIC Technical Report. Vol. 102, No. 178, pp. 115-118. Elers, Kai-Erik, Ville Saanila, Pekka J. Soininen, Wei-Min Li, Juhana T. Kostamo, Suvi Haukka, Jyrki Juhanoja, and Wim F.A. Besling. 2002. "Diffusion Barrier Deposition on a Copper Surface by Atomic Layer Deposition" (Abstract). Advanced Materials. Vol. 14, No. 13-14, pp. 149-153.							
							nd	
							102,	
				H. Tsai, M.W. Lin, C Damascene Technolo				
	Van der Straten, O., Y. Zhu, E. Eisenbraun, and A. Kaloyeros. 2002. "Thermal and Electrical Barrier Performance Testing of Ultrathin Atomic Layer Deposition Tantalum-Based Materials for Nanoscale Copper Metallization." <i>IEEE</i> . pp. 188-190.							
	M.S. Liang. 2002. Carbide Barriers for	"Advanced M r 90/65-nm BE	etal Barrier Fre OL Technology	Chen, G.J. Wang, Ye Cu Damascene Inte	rconnects v	_	-	and
	July 25, 2003. International Search Report for PCT/US02/24858. March 30, 2004. Written Opinion for PCT/US02/19062. April 9, 2004. Written Opinion for PCT/US02/19116. April 22, 2004. Office Action for U.S. Serial No. 09/998,372, filed November 30, 2001.							
-								
	April 22, 2004. Off	ice Action for				, 2001.		
EXAMINER				ATE CONSIDEREI)			

		<u> </u>
INFORMATION DISCLOSURE	ATTY. DOCKET NO.	SERIAL NO.
CITATION IN AN	005920 USA/ PMG/PCTRL	09/943,383
APPLICATION	TWO/TETIES	
(PTO-1449)		
<u> </u>	APPLICANT	
AUG 1 1 2004	SHANMUGASUNDRA	M et al.
	FILING DATE	GROUP
OTHER ART (Including Author	August 31, 2001	2823
OTHER ART (Including Author	, Title, Date, Pertinent Page	s, Etc.)
April 29, 2004. Written Opinion for PCT/US	02/19061.	
May 5, 2004. Office Action for U.S. Serial No.	o. 09/943,955, filed August 31	, 2001.
May 5, 2004. International Preliminary Exam		
June 3, 2004. Office Action for U.S. Serial No.	o. 09/928,474, filed August 14	, 2001.
June 23, 2004. Office Action for U.S. Serial N	No. 10/686,589, filed October	17, 2003.
June 30, 2004. Office Action for U.S. Serial N	No. 09/800,980, filed March 8,	2001.
July 12, 2004. Office Action for U.S. Serial N	o. 10/173,108, filed June 8, 20	002.
	 	
		w
EXAMINER	DATE CONCIDENCE	
EAMMINER	DATE CONSIDERED	